

XXIV. *On the early Stages of Development of Lemanea fluviatilis, Agardh.*

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IT is not a little remarkable that the early condition of our very abundant *Lemanea fluviatilis* should have so long escaped the observation of botanists, and this can perhaps only be accounted for by the circumstance of its bearing a very considerable resemblance to *Trentepohlia pulchella*, β . *chalybea*, Harvey (*Conferva chalybea*, Dillwyn), not only in its colour and general appearance when growing, but also in the kind of situations in which it occurs; the two species, indeed, may not unfrequently be found growing intermingled.

Towards the end of November the young *Lemanea* may be observed in the greatest abundance in places where the species occurs, covering the surface of stones with a uniform dark olive somewhat villous coating, and adhering with such pertinacity by means of its minute roots, as not to be detached without injury to these, or by removing a part of the stone on which it is growing.

On examining more minutely the character of the plant in this early stage of its growth, the structure will be found to consist of numerous conferva-like filaments, of about one line in length, sparingly branched in the manner of *Trentepohlia* or of *Conferva glomerata*. Each of its filaments is about $\frac{1}{1100}$ in. in diameter, and consists of a single row of cells, which are from four to six times longer than wide. The endochrome or colouring matter of the cells is of a blue-green colour, and arranged in a spiral manner, except in the terminal cells, where it is more abundant, and thus gives to these a darker colour than the rest of the plant. In many of the cells, however, the spiral vittæ are so divided and contorted as to give the endochrome a reticulated appearance.

The structure, so far as has been now described, might well be mistaken

for a minute Conferva; yet, notwithstanding, it bears the same relation merely to the mature *Lemanea* that the confervoid shoots do to the perfect Moss, or the *mycelium* to the fully-developed Agaric.

Kützing in his 'Phycologia Generalis,' p. 322. tab. 19. fig. 10, has described and figured the early condition of *Lemanea torulosa*, Ag. Except in the more considerable development of the primordial confervoid filaments of the *Lemanea fluviatilis*, there is little difference in the mode of growth of the two species.

From a cell near the base of the conferva-like structure a branch is given off (TAB. XIX. fig. 8 a & b), which at first differs apparently from one of the ordinary branches only in the cells of which it is composed being much shorter. This little branch, however, increases very rapidly in length as well as thickness from the multiplication of its cells by frequent fissiparous division. At one period of its growth it recalls to mind the *silicle* of an *Ectocarpus*; but the similarity does not long continue, for it soon exceeds in height by many times the conferva-like filaments; and as this rapidity and excess of development has called for a greater supply of nourishment and a firmer support than could be furnished by the filament from which it took its origin, a number of roots have been given off from its own base (just as occurs in the *phyton* of a Moss), by which it is enabled to assume an independent existence (fig. 8 b & c), and from this period it by degrees puts on the well-known characters of the *Lemanea* frond, which it is quite unnecessary to describe upon this occasion.

The subject of the early stages of growth of the Algæ opens a wide field for investigation, which would doubtless repay the careful observer by the discovery of many most interesting facts, valuable to the physiologist as well as to the systematic botanist. It is highly probable that very many of the structures now classed with the *Palmelleæ* are merely immature states of more complicated species; and there are perhaps many others of the same character which we at present look upon as being in the condition of complete maturity. For arriving at safe conclusions, however, in such investigations, a good microscope and a practised eye are indispensably requisite, since without such precautions, really essential characters in these minute forms easily escape detection, and structures totally different come to be considered iden-

tical; and it may easily be conceived to what confusion and mischief the promulgation of such errors may give rise.

EXPLANATION OF PLATE XIX.

Fig. 7. The young state of *Lemanea fluviatilis*, Agardh, of the natural size.

Fig. 8. The same, highly magnified, showing at *a*, the early development of a branch;
b, another branch, more advanced, from which rootlets are given off at the base;
c, a still more developed branch, attached by its roots.

